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(1) XC-142A

VTOL TRANSPORT PROGRAM.

(15) CONTRACT NO. AF33(657)-7868

(9) MONTHLY PROGRESS REPORT NO. 4

FOR

MAY 1964.

LTV VOUGHT AERONAUTICS DIVISION

(11) May 64,
(13) 33 P.

L. C. Josephs
Program Director

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INTRODUCTION

This report has been prepared in accordance with the requirements of Item 7 of Contract Number AF33(657)-7868 and is the twenty-ninth in a series of monthly reports covering activity on the XC-142A VTOL Transport Aircraft Program.

This report is devoted specifically to a summary of progress for the month of May, 1964.

SUMMARY

At the end of May, 1964, the XC-142A program was considered to be approximately two weeks behind schedule. Except for tool maintenance and design changes, the tooling task was complete, the engineering effort 83% complete and the manufacturing work 76% complete. Final assembly and installation work on the #1 aircraft progressed to the point by mid-May wherein the aircraft was moved from the final assembly line to the airport area for painting, fuel calibration tests and installation and checkout of the engines and transmission system prior to initiation of the 50-hour tie-down test anticipated the latter part of June. The #2 aircraft moved from the final assembly area to the test lab in early May for flight test calibration work and controls and systems checks. At the end of the month the aircraft was on schedule for return to the manufacturing area by mid-June for completion of final installation and operational checkout work leading to first flight on this aircraft in July. At the end of the month the #3, 4 and 5 aircraft were on schedule toward shop completion in September, November and December 1964 respectively.

The static test program made significant progress during the month completing all work on the longitudinal system and initiating drop tests. By the end of the month, the scheduled standard phase of the drop test program was essentially complete with the remainder of the effort, which will include less severe condition drops, to be complete by mid-June. A significant milestone was achieved during the month in that the flight control simulator completed sufficient testing by 22 May to clear the aircraft for first flight. Build-up and checkout of the PITS rig continued during the month with the anticipation of starting functional testing in June. The main propeller integral gearcases

became available with heat rejection fixes incorporated and were installed and being checked out on the PITS rig at the end of the reporting period. The first two main propeller integral gearcases for installation in the #1 aircraft became available during May.

Two firm proposals were submitted during the month:

Repair of T-64-1 Engine Ser. No. 260106
Ground and Flight Transition Training

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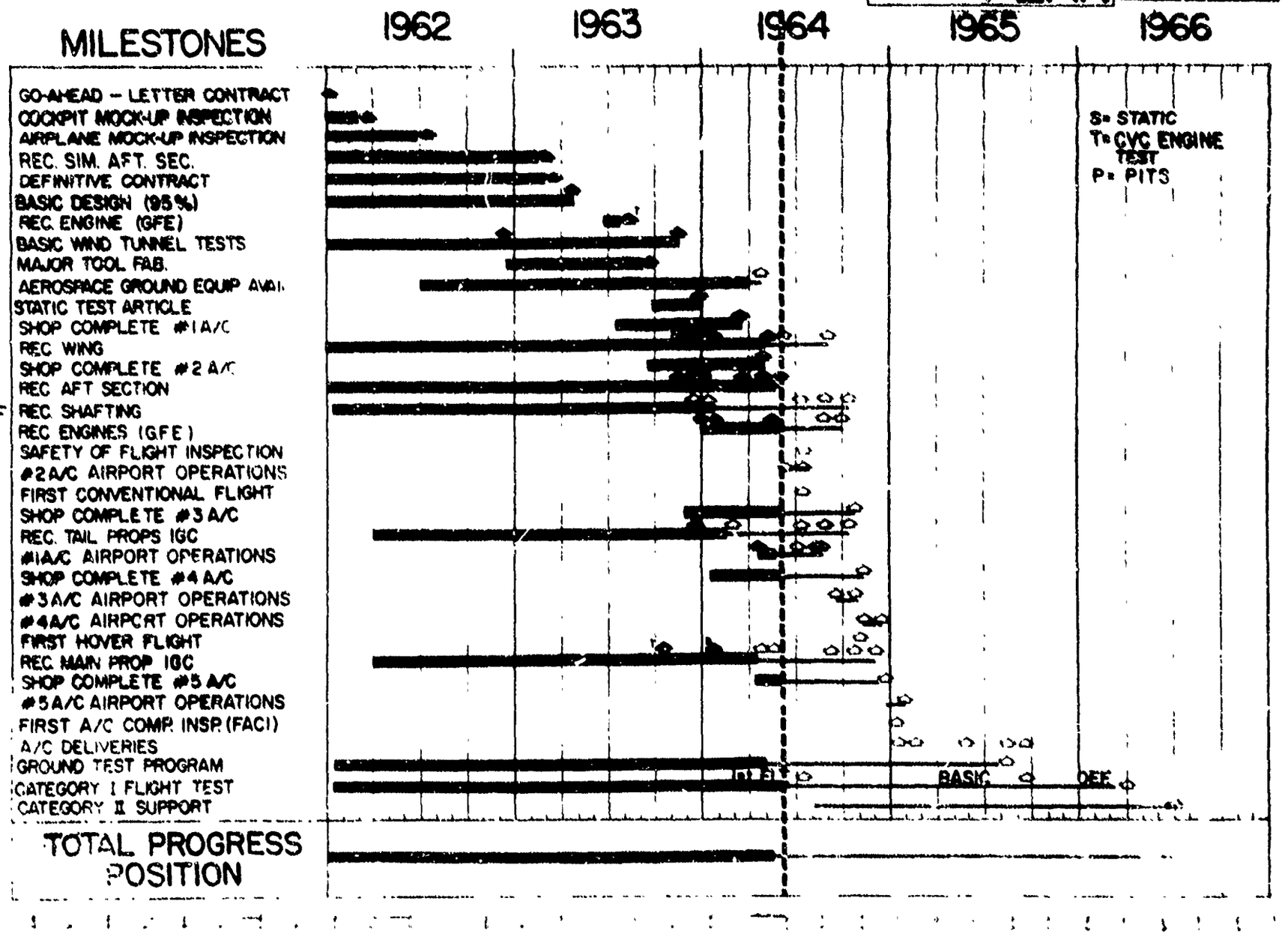
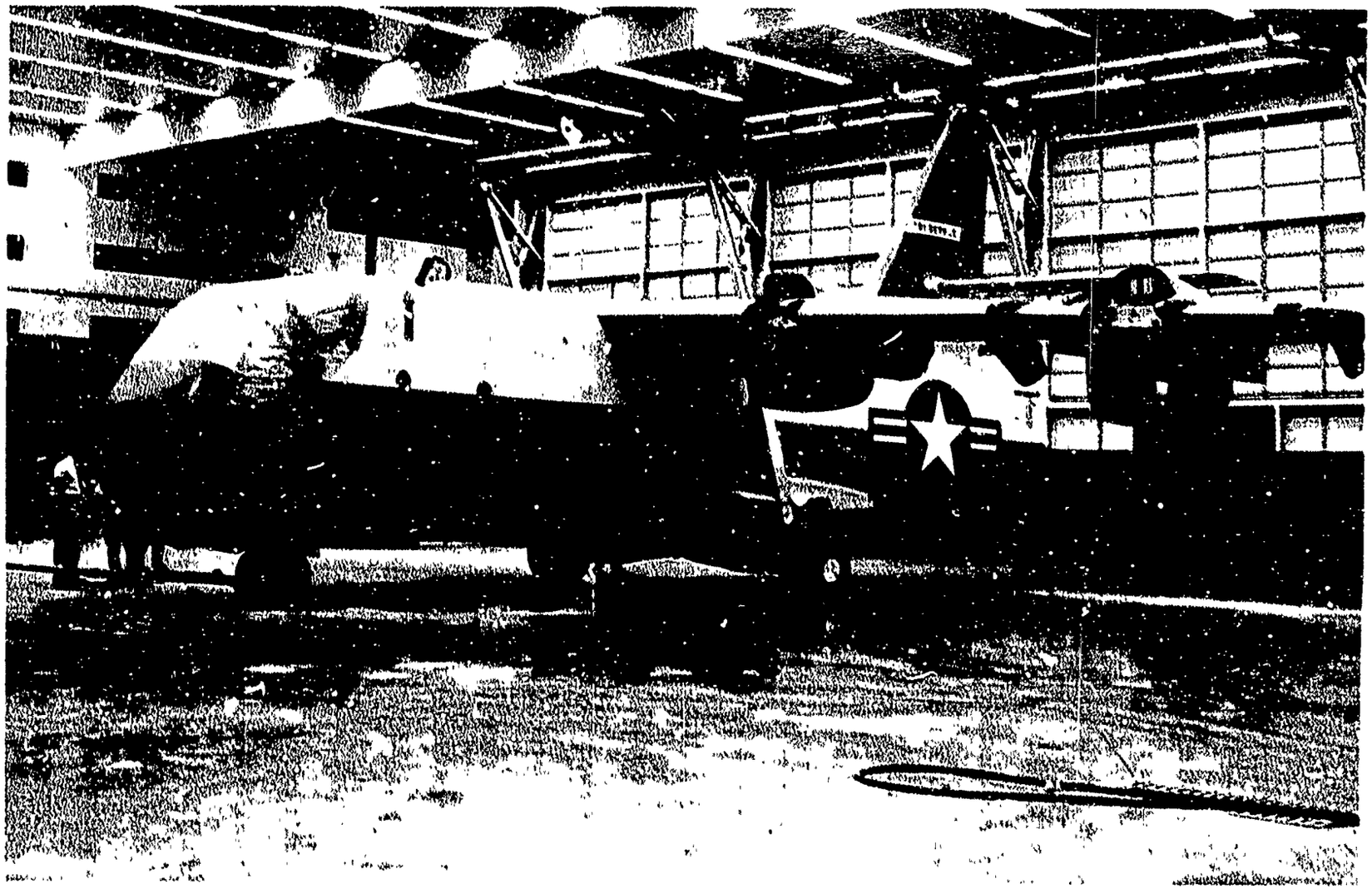
PROGRAM MASTER PLAN





XC-142A NUMBER 1 AIRCRAFT AFTER PAINTING AT LTV

ITEM 1.A DEVELOPMENT OF XC-142A AND FABRICATION OF FIVE PROTOTYPE MODELS

1.A.1 ACCOMPLISHMENTS

The #1 aircraft progressed sufficiently with mockup and final installation work during the month so that it was moved to the airport area on 15 May, followed by painting, fuel system tests and partial completion of transmission system installations. The first main integral gearcase to have passed acceptance testing at Hamilton Standard was received at LTV on 26 May for installation in the #1 aircraft. The #2 aircraft was transferred to the test lab on 9 May for ECP 10 calibration, control system rigging and hydraulic and control system checks. At the end of the month it was expected that the aircraft would be returned to the manufacturing area by mid-June as scheduled for completion of final installations and operational checkout work leading to first flight in July. At the end of May, the #3 aircraft was on schedule in the final installation line toward shop completion in September, the #4 aircraft on schedule in the nose and mid-section fixtures toward shop completion in November and the #5 aircraft slightly ahead of schedule in the lower and upper mid-section fixtures toward shop completion in December, 1964.

Production shafting was successfully honed internally to remove decarburization and suspected surface cracks. At the end of May, the first aircraft set of shafting was ready for bearing installation and balancing. The reworked ball splines were successfully acceptance tested during the reporting period. The #3 wing was shipped from Ryan to LTV on 27 May. The #4 wing continued in the pickup station with delivery projected for early August. The #5 aft section and empennage was expected to complete fabrication in early June.

1.A.2 PROBLEM AREAS

1.A.2.1 Rear Engine Mounts

The alternate material (Viton-A) discussed in the report for last month resulted in unsatisfactory performance; however, the vendor developed a mount utilizing G.E. silicone and four of these mounts were undergoing Engineering evaluation at the end of May with results expected by mid-June.

1.A.2.2 Servo Isolation Valve (Stabilization System)

Previously reported silting difficulties with the Bonson valves were eliminated during May by changing to Bendix valves with a sufficient number of valves being diverted from another program to satisfy immediate needs.

ITEM 1.B FABRICATION OF STATIC TEST ARTICLE (Complete)

ITEM 2 FABRICATION OF MOCKUP (Complete)

ITEM 3 GROUND TEST PROGRAM

3.1 ACCOMPLISHMENTS

3.1.1 Wind Tunnel (Complete)

3.1.2 Structural Tests

3.1.2.1 Engine Mount Element Tests

Qualification testing of the new procurement integral gearcase adapters was completed on 12 May. One each of the 210-95525-1 and -3 and one each of the 210-95526-1 and -3 adapters satisfactorily withstood design ultimate tension and compression loads.

3.1.2.2 Static Test Program

3.1.2.2.1 Instrumentation

Static test article instrumentation continued on schedule.

3.1.2.2.2 Aircraft Drop Tests

The first test drop (5 fps sinking speed) was conducted on 6 May. A total of 27 drops were made during the month of May. Three nose gear

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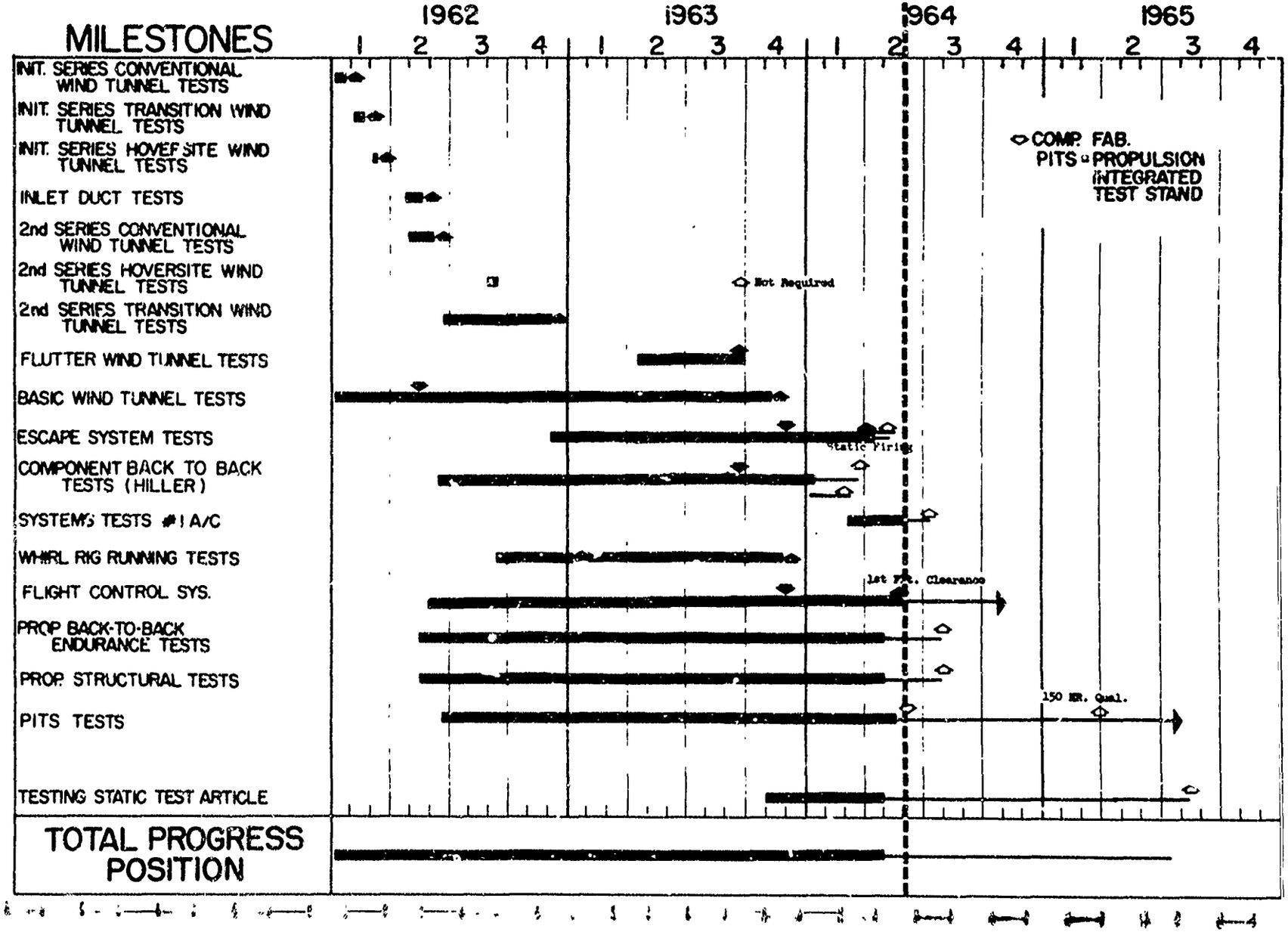
GROUND TEST MASTER PLAN



metering pin changes and two modifications of the 210-34601-1 main gear bearing had been made during the test program at the end of the month. A redesign of the main gear metering pin will probably be required before completion of the drop test program. (See paragraph 3.1.2.2.3, Item 8)

3.1.2.2.3 Aircraft Static Test

In accordance with the requirements of the Contract Data Requirements Document, progress of the static test program is reported as required by Specification MIL-A-8868 (ASG) (paragraph 3.8.1). The schedule on page 9 provides a graphic presentation of the static tests conducted to date and the revised estimates for accomplishing the remainder of the static test program. In the discussions that follow, the paragraph numbers and titles refer to those shown on the schedule on page 9.

1. Jig Wing - Complete

2. Wing Chordwise and Engine Mount Wing-Up Flight - Complete

Test results of the wing-up flight condition test and engine mount test were prepared. LTV Report 2-59900/3R820, Part III test results will be submitted to ASD in June, 1964.

3. Aileron/Flap Operation (Aileron Function) - Complete

The aileron operational tests results were prepared. LTV Report 2-59900/3R812, Part I test results will be submitted to ASD in June, 1964.

4. Aileron/Flap Operation (Flap Function) - Complete

The flap operational test results were prepared. LTV Report 2-59900/3R812, Part I test results will be submitted to ASD in June, 1964.

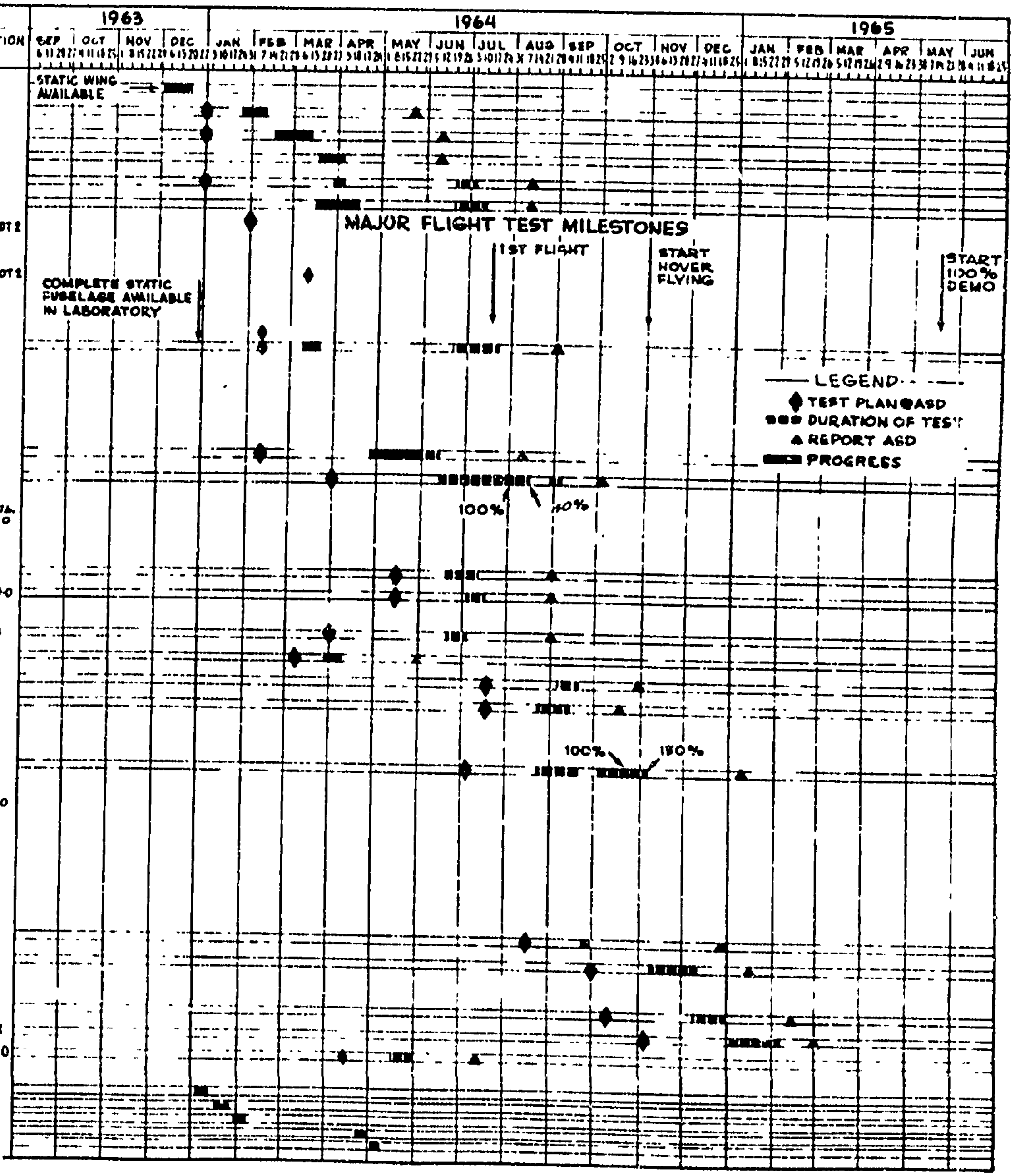
5. Slat Operation

As reported in April, the inboard slat 210-80090-3 failed to lock properly under 90% of the Condition I loads. The slat was returned to

VTOL XC-142A

SCHEDULE OF STATIC TESTS

TEST REPORT NUMBER		% LOAD	SECTION OF MIL A-8867	TEST CONDITION CODE
	1. JIG WING	—		
259900/SR 820 PT. III	2. WING CHORDWISE & ENG. MOUNT WING-UP FLT	150	3.2.2 ADD(3), 3.2.9.1(c)	VTO 1 (f)
812	3. AILERON/FLAP OPER (AILERON FUNCT)	100	3.2.2 ADD (4)	LAR 1 (f)-O
812	4. AILERON/FLAP OPER (FLAP FUNCT)	100	3.2.2 ADD (4)	TOT 1, TOT 2
813	5. SLAT OPERATION	100	3.2.2 ADD (4)	TOT 3
	6. CONTROL SURFACES & LINK ON WING	150		
812	a AILERONS		3.2.2 (f), 3.2.8 (b)	LAR 1 (f)-O, TOT 1, TOT 2
812	b FLAPS		3.2.2 (e), 3.2.8 (e)	TOT 1, TOT 2
813	c SLATS		3.2.2 (i), 3.2.8 (d)	TOT 3
812	d AILERON SUPPORTS		3.2.2 (f)	LAR 1 (f)-O, TOT 1, TOT 2
812	e FLAP SUPPORTS		3.2.2 (e)	TOT 1, TOT 2
813	f SLAT SUPPORTS		3.2.2 (i)	TOT 3
814	g. CONTROL LINK LOCATED IN WING		3.2.8 (b)(d)(e)	PAE, FIA
814	7 STATIC TEST OF CONTROL LINKAGE LOCATED IN FUSELAGE	150		
	a. LONGITUDINAL CONTROL SYSTEM		3.2.8 (a)	PAE
	b AILERON CONTROL SYSTEM		3.2.8 (b)	PAE, FIA
	c RUDDER CONTROL SYSTEM		3.2.8 (c)	PAE, FIA
821	8 DROP TEST	100	3.3	VLD 1, STL 3
820 PT I	9 SYMMETRICAL TEST	150		
	a. WING		3.2.2 (a)(b)	GMA 1 (f)-O
	b FUSELAGE		3.2.4 (a)(d)	LAE(f)-7A, LA3(f)-7A, GMA1-O, GIMA 2(f)-O
	c COCKPIT ENCLOSURE		3.2.9.3 (a)	LA3 (f)-7 b
	d ENGINE MOUNTS		3.2.9.1 (a)	GMA 1 (f)-O
817	10 UHT OPERATION	100	3.2.3 ADD (2)	PCA
817	11. STATIC TEST OF UHT SUPPORT STRUCT & UHT PC LINKAGE	150	3.2.3(a)(b) 3.2.8 (a)	HAP(a)-O, GIMA 2(f)-O, PCA
820 PT X	12 WING TILT OPERATION	100	3.2.8 ADD (1)	TOT 1, TOT 2, TOT 3
823 PT II	13 SEAT SUPPORT STRUCTURE	150	3.2.9.2 (c)	CRASH
820 PT VI	14 TAIL BOOM	150	3.2.3 ADD (1)	VLD 1
820 PT. III	15 WING UP FLIGHT	150		
	FUSELAGE (WING PIVOT BULKHEAD)			VTO 1 (f)
820 PT II	16 UNSYMMETRICAL FLIGHT	150		
	a WING		3.2.2 (c)	LAR 1 (f)-O
	b FUSELAGE		3.2.4 (c)(b)	MAR 1 (f) O, MAR 2(a)-O
	c. COCKPIT ENCLOSURE		3.2.9.3 (b)	LAR 2 (f)-7 b
	d. VERTICAL TAIL		3.2.3 (e)(f)(g)	MAR 3 (f)-O
	e RUDDER		3.2.3 (g)	
	f RUDDER SUPPORT		3.2.3 (g)	
	g RUDDER PC LINKAGE		3.2.8 (c)	MAR 3 (f)-O
	h ENGINE MOUNTS		3.2.9.1 (b)	LAR 1 (f)-O
818	17 RUDDER OPERATION	100	3.2.3 ADD (2)	MAR 3 (f)-O
820 PT IX	18 LANDING RESPONSE-WING UP	150	3.2.2 ADD (2)	VLD 1
823 PT I	19. CARGO DOOR STATIC TEST	150	3.2.9.3 ADD (1)	LOAD
822	20 LANDING GEAR SUPPORT STRUCTURE	150		SPIN UP SPRING BACK
259900/SR 816	21. UHT STATIC	150	3.2.3 (a)(b)	HAP(f)-O GIMA 2(f)-O
	22 ECP 10			
	a #2 A/P UHT			
	b #1 A/P WING			
	c. #2 A/P WING			
	d #1 A/P TAIL BOOM			
	e #2 A/P TAIL BOOM & VERTICAL TAIL			



Manufacturing for modification. Tests are scheduled to resume in July, 1964.

6. Control Surfaces and Linkage on Wing

a and d Ailerons

The aileron static test will be resumed in July after structural modifications have been incorporated on the 210-80116 inboard static test aileron.

b and e Flaps

Results of the flap operational and static tests were prepared. LTV Report 2-59900/3R812, Parts I and II will be submitted to ASD in June, 1964.

c and f Slats

Static load tests of the inboard slat are scheduled to be conducted in July after completion of the slat operational tests.

g. Control Linkage in the Wing

The propeller pitch control linkage, 210-58200, assembly was tested to 150% limit load on 28 May 1964.

7. Static Test of Control Linkage Located in the Fuselage

b and c Tests of the aileron and rudder systems are scheduled to start in June, 1964.

8. Drop Test

The drop test program was started 6 May. A summary of the tests conducted in May 1964 is presented as follows:

Date	Drop No.	Sink Speed (feet per second)	Aircraft Attitude	
6	0	5.	3 pt.	STOL
7	1	8.6	3 pt.	STOL
8	2	9.0	3 pt.	STOL

(Continued)

Date	Drop No.	Sink Speed (feet per second)	Aircraft Attitude	
9	3	10.0 (1)	3 pt.	STOL
11	4	8.6	2 pt.	STOL
12	5	10.0	2 pt.	STOL
13	6	11.0	2 pt.	STOL
13	7	11.5	2 pt.	STOL
14	8	12.0	2 pt.	STOL
15	9	8.6	2 pt.	VTOL
15	10	10.0 (2)	2 pt.	VTOL
16	11	10.0	3 pt.	STOL
16	12	11.0 (3)	3 pt.	STOL
19	13	11.0	3 pt.	STOL
19	14	12.0	3 pt.	STOL
20	15	10.0	3 pt.	VTOL
20	16	11.0	3 pt.	VTOL
20	17	12.0	3 pt.	VTOL
21	18	11.19 (overload)	3 pt.	VTOL
21	19	11.19 (overload)	3 pt.	STOL
22	20	10.0	Nose First	STOL
23	21	11.0	Nose First	STOL
23	22	12.0	Nose First	STOL
25	23	10.0 (4)	Nose First	VTOL
25	24	11.0 (5)	Nose First	VTOL
27	25	11.0	Nose First	VTOL
28	26	12.0	Nose First	VTOL
28	27	10.0 (6)	2 pt.	VTOL

NOTES: (1) Nose Gear metering pin change required.
(2) Main Gear metering pin change required.
(3) Nose Gear metering pin change required.
(4) Main Gear 210-34601-1 bearing rework for this drop.
(5) Nose Gear metering pin change required.
(6) Main Gear 210-34601-1 bearing rework for this drop.

Changes in test sequence and repeat drops have been required because of metering pin redesign. The drop test program is anticipated to be complete by mid-June.

9. Symmetrical Test

The Symmetrical Test Plan Report 2-59900/3R820, Part I, was approved by ASD. In comparing the loads used in the test plan with the final

loads shown in the loads reports it was decided that a new test plan was required for the symmetrical test. This new plan will be submitted to ASD in June, 1964.

12. Wing Tilt Operation

The Wing Tilt Operational Test Plan, Report 2-59900/3R820, Part V, was approved by ASD.

13. Seat Support Structure

Test results of the Seat Support Structure test were completed. LTV Report 2-59900/3R823, Part II, test results will be submitted to ASD in June, 1964.

21. UHT Static Test

Static tests of the UHT were not conducted in May as scheduled. The test plan, LTV Report 2-59900/3R816, had not been approved by ASD at the end of May.

22. ECP 10

The #2 aircraft vertical tail calibration was completed 13 May 1964.

3.1.3 Flight Control System Tests

3.1.3.1 Prop Pitch Actuator Transfer Valve

The remaining 20 hours of the second 100-hour endurance cycle on the main transfer valve assembly utilizing ductile iron outer sleeves was completed on 5 May. A disassembly and visual inspection revealed the sleeves to be in good condition. No further endurance testing is planned prior to the transfer valve qualification program which is scheduled to start in June.

3.1.3.2 Flight Control System Test Stand

Closed loop checkout of the simulator continued with clearance of the control system for first flight achieved on 22 May. This clearance is for ten

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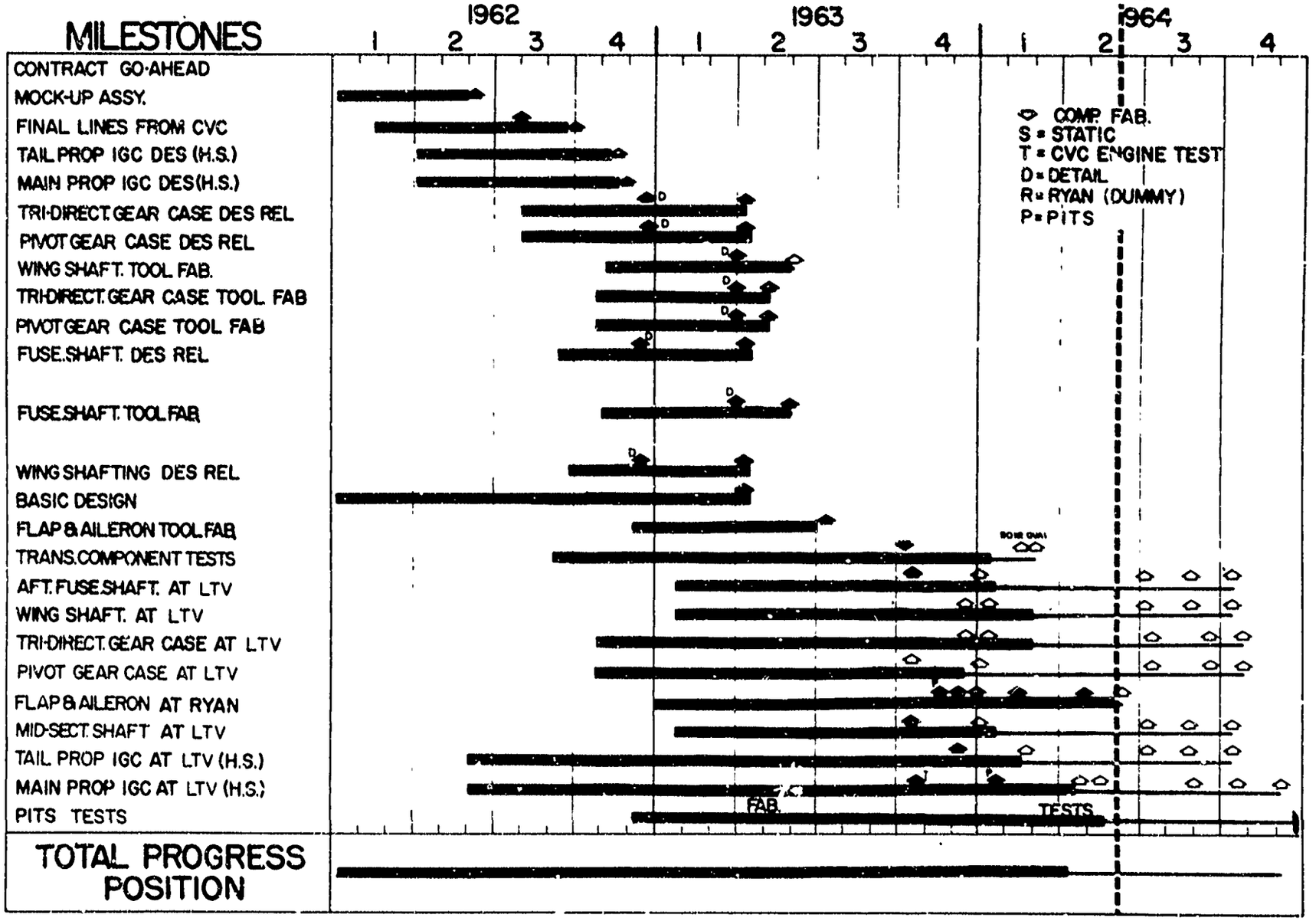
HILLER MASTER PLAN



degrees wing incidence or less. Closed loop tests were then started for the transition and hovering modes.

3.1.3.3 Airplane Control and Hydraulic System Tests

Control and hydraulic system tests were started on the #2 aircraft on 21 May. The tests continued through the end of May on schedule and are expected to be completed in mid-June.

3.1.4 Engine System (Complete)

3.1.5 Airplane Vibration Tests

3.1.5.1 UHT Vibration Tests

3.1.5.1.1 Vibration tests on the #3 aircraft UHT installed in a rigid test fixture were performed on 4 May.

3.1.5.1.2 Vibration tests on the #2 aircraft UHT installed on the #2 aircraft were performed on 22 May.

3.1.6 Fifty-Hour Tie-Down Tests

The checkout procedure for the 50-hour tie-down tests was prepared. A technical review of the tie-down program is scheduled at ASD on 9 June including the test set-up, the run plan, and checkout phase.

3.1.7 Transmission Sy tem Tests

3.1.7.1 Main Integral Propeller Gearcase System

3.1.7.1.1 Engine Systems Test

The main IGC propeller 50-hour qualification penalty run was initiated and interrupted after 41 hours in order to acceptance test the #1 aircraft units. Deviations were requested and granted to acceptance test #1 aircraft units without functional testing of the overrunning clutch and propeller decoupler.

3.1.7.1.2 Back-to-Back Test

The left-hand main IGC back-to-back development tests were

completed and the qualification test initiated.

3.1.7.2 Back-to-Back Test Stands

3.1.7.2.1 Pivot Gearcase

The 210-75912, -75913, -35961, 35977 and 35979 gears were reworked to include an undercut in the corner radius between the gear head and the bearing land. Gear head surface was shot peened including the undercut.

An attempt on 7 May to get 10 million cycles at full load on the reworked 35977 bevel gear ended at 6 million cycles with failure of the 35967 shaft in the slave gearcase. The 35961 and 35963 gears in the slave gearcase were also found to be cracked. (The ball bearing on the 35968 gear looked good).

A teardown inspection of the specimen gearcase was conducted and revealed the following discrepancies:

a. There was a crack in the 35399 housing half.

b. The 35964 shaft splines were cracked and there was moderately heavy fretting corrosion on the splines and pilot shoulder.

c. The 35963 gear had equivalent fretting on parts mating with the 35964 shaft.

d. There was loss of torque on major bearing stacks.

e. A scuffing pattern was observed high on the heels of the 35977 gear teeth.

Corrective action as follows was taken:

a. Radius the fillet area around the support for the 35399 housings.

b. Review clamp-up of bearing stacks.

c. Add more locking pins to steel pivot liner.

d. Electron-beam weld the 35963 gear onto the 35964 shaft. (Eight sets were shipped back to Indiana Gear Works to be so welded.)

e. Salvage the 35399 housing by Heliarc welding, add brackets, reassemble, and finish the 10 million cycle endurance run.

Four sets of electron-beam welded gear and shaft assemblies were received on 22 May. After inspection they were sent to local outside processing sources for shot peening and electrolysis nickel plating. The final three sets are scheduled to arrive at the Hiller facility on 3 June.

The acceptance test of the #1 aircraft gearcase was completed on 31 May, and a subsequent teardown inspection revealed that the 35344 clutch drive shaft showed plastic deformation of the spline at the clutch end. The amount of twist was approximately 20 degrees. This was caused by the inadvertent operation of the gearcase tilting mechanism with the clutch locked in at 3000 psi. An interlocking device is being installed on the test stand to prevent reoccurrence.

Analysis of this condition revealed that a load of approximately 38,700 inch pounds had been applied to the shaft, equivalent to 1.39 times the ultimate design load or 3,540 hp. This loading exceeds the loading requirements as required by the static test of the pivot gearcase by approximately 4 percent. As this loading exceeded the yield point of the part, this assembly is not considered suitable for flight; however, the parts will be inspected and salvaged for the static test assembly where suitable acceptance test of a second unit was initiated.

Gears were acid etched to determine grain flow direction and it was found that the 75913 and 35977 gears had cross flow of grain. New forgings were purchased and new gears were being expedited at the end of May. Replacement gears will be available approximately 10 August, at which time the PITS gearcase

will be disassembled and the new gears incorporated. In the interim, the existing gears are considered suitable for 50-hour life.

Replacement gears for the aircraft gearcases will be available 30 August and it is planned to install the new gears as follows:

Aircrafts Nos. 1, 2 and 3	Original Gears to be replaced at the 50-hour overhaul period.
Aircrafts Nos. 4 and 5	Replacement gears to be installed prior to delivery.

3.1.7.2.2 Tri-Directional Gearcases

New 210-75997 and 210-75998 gears and 210-35362 gear assemblies were made available during the month. Four additional sets of gears were promised for receipt at month end. The beryllium copper scavenge pump drive gears were finished, but salvage action on the bearing journals had to be taken. This salvage consisted of electroless nickel plating the journals to proper size. New schedules were prepared for the gearcases. Acceptance testing of the #1 aircraft tri-directional gearcase began on 29 May with the following results:

Inspection of the gearcase prior to the final test revealed severe tooth wear on the pump drive gear (75914-2). Total running time on the gear was five hours. DIET tests run concurrently with the assembly and acceptance testing of the beryllium copper gear revealed wearing characteristics similar to those on the former aluminum bronze gear. The exact cause of the severe wearing condition is not known at this time; however, lubrication and possible misalignment are believed to be contributing factors.

The following action was being taken at the close of the reporting period:

(1) Replace worn gear 75914-2 with a new aluminum bronze gear 75914-1.

(2) Relocate oil jet to input side of 75914-1 gear.

(3) Conduct acceptance testing with special monitoring of the new gear.

3.1.7.3 Propulsion Integrated Test Stand (PITS)

The wing tilt system was installed and checked out, and the CSD declutching unit rigged. Fabrication was begun of a metal center leading edge to replace the inadequate plexi-glass section. Checkout was completed of the power cart mockup line synchronized interlock. The PITS right-hand main IGCs and propellers were received at PITS on 11 May with all the baffles and rework resulting from the 50-hour qualification test on the right-hand IGC propeller installed.

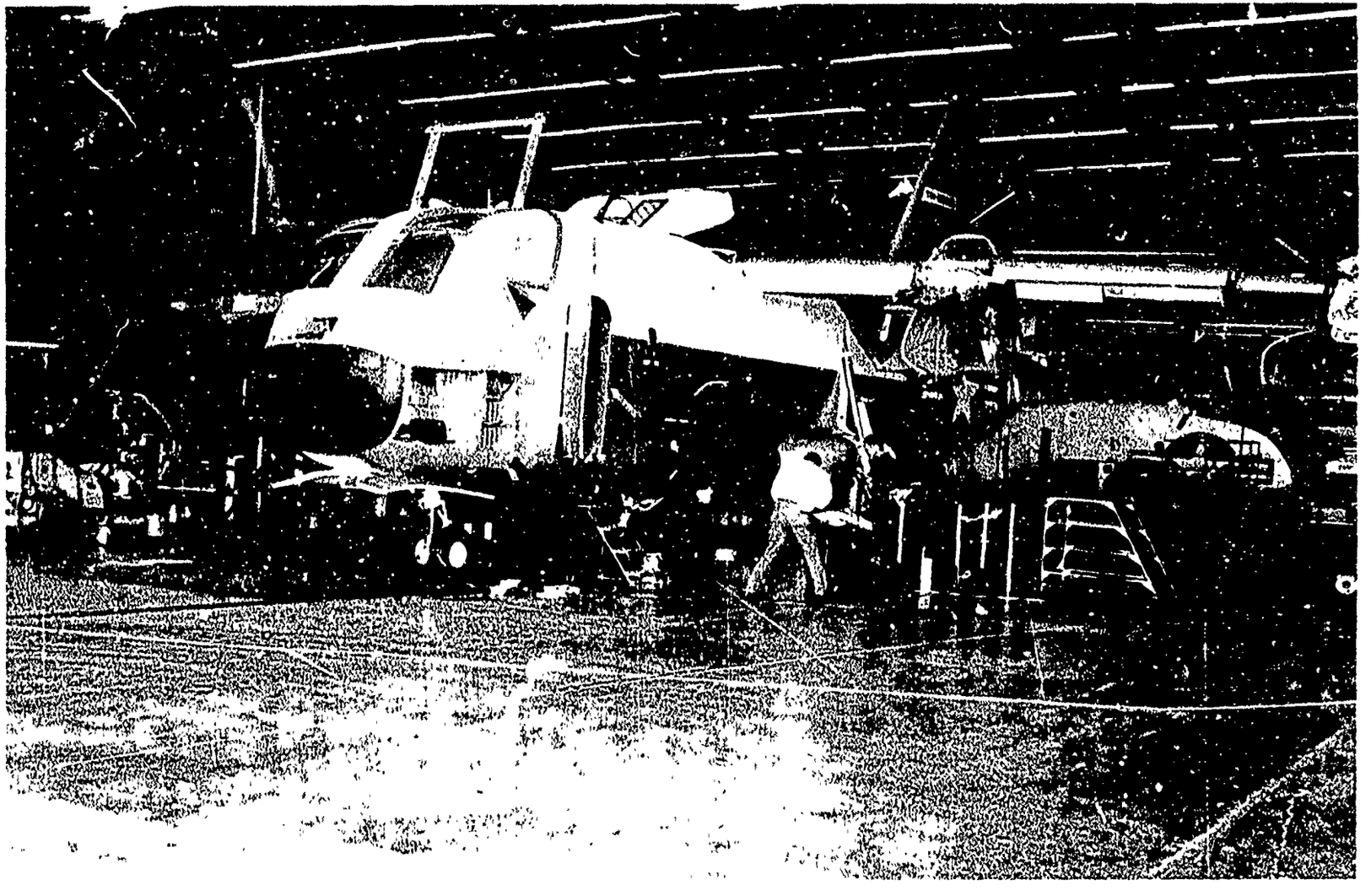
The tail rotor transfer valve was rebuilt and leak-tested. Wing tilt friction adjustment and installation of vibration pickup bracket on the engine was completed. The tail rotor gearbox lube oil pump was installed. Fabrication of steel drag strut drill templates and wing drag strut load path beefup was completed. Completed checkout running on engine #1 with satisfactory results. The prop pitch control system was synchronized.

The PITS test plan was revised to incorporate all ASD requested changes with certain exceptions for which explanations were given. Submission of the test plan to ASD is anticipated in early June.

3.1.7.4 Structural Test

3.1.7.4.1 Wing Shaft Fatigue

Honing of the wing shafts was completed. The shaft instrumentation slip rings passed acceptance tests. All slip rings will be balanced on their respective shafts. Two independent metallurgical tests by LTV and HAC on failed inner races of the 1912-SZZ-5 bearing revealed hydrogen embrittlement. It was



XC-142A NUMBER 1 AIRCRAFT UNDERGOING FUEL SYSTEM TESTS AT LTV

decided to obtain new bearings, with the exception that the present bearing would be acceptable for PITS after certain rework and successful dead load (deformation) testing for 16 hours at 2250 lbs. A set of -5 bearings for PITS was dead load tested for use on the PITS wing shafts during the pre-operational and operational checkout. New bearings (48 total) are to be on dock at Hiller on 8 and 30 June with additional units to follow in August.

The new bearing configuration will delete the cadmium plate from the entire inner race and from the outer race. The aligning ring will be cadmium plated and all rework done on the -5 bearings will also be accomplished on these bearings, except that there is no requirement to dead load test the inner races for hydrogen embrittlement. The bearings are to be zinc chromated after installation on the shafts to afford corrosion protection.

3.1.7.4.2 Fuselage Shaft Static

It was decided not to hone the fuselage shafts because the I.D. surfaces of the random samples were clear of surface tears or cracks.

The Saginaw ball spline coupling was reworked as reported in the report for last month and successfully completed 111 hours of quality assurance testing (30 hours at 240 hp, 30 hours at 850 hp, and 50 hours at 950 hp). Static test of the unit with the 5/16-inch screws was conducted up to 180 percent of limit load without permanent set failure. It was found, however, that a screw torque of 300 inch-pounds would not develop sufficient friction to keep the bolts from loading in shear. The cadmium plating was removed from the mating flange surfaces and the unit retested with satisfactory results. No slippage occurs up to 56 percent of limit load (950 hp). Acceptance testing was underway at the end of May.

3.1.7.4.3 Wing Shaft Static

The wing cross-shaft test was conducted, with the specimen reaching 162 percent of limit torque without failure, at which time the torque inducer bottomed. The Bendix ball spline coupling was removed and the torque increased to 180 percent times limit when the shaft failed. With the wall thickness material properties correction on the shaft, the test can be considered a success.

3.1.8 Fuel System Tests

3.1.8.1 Forward Transfer Cell Qualification

The qualification tests were started on 22 May. Low pressure leak tests of the bladder cell were completed. The cell was installed in the cavity and the cell installation pressure tested. The tests will be complete in June.

3.1.8.2 The aircraft fuel system tests were successfully completed on #1 aircraft on 23 May.

3.1.11 Hydraulic System

3.1.11.1 Component Qualification

3.1.11.1.1 UHT Actuator Components - Qualification tests were completed.

3.1.11.1.2 PC-2 Reservoir - The life cycling tests were completed; however, on disassembly of the reservoir for the post endurance inspection, a crack was noted in the piston to rod radius. The failure was attributed to a piston material problem. Consequently, a piston of different material but of identical configuration will be incorporated.

3.1.11.1.3 Aileron, Rudder, Pitch Stabilization and Roll Feel Isolation Actuators - All qualification tests through pressure cycling endurance have been completed thus far.

ITEM 4 ENGINEERING DATA

4.1 ACCOMPLISHMENTS

During May the engineering effort continued to be devoted to support of the manufacturing and test programs as well as the preparation of required program documentation. At the close of the reporting period weight of the aircraft was 1255 pounds over guarantee reflecting a decrease of six pounds during the month. Performance parameters of the aircraft remained within specification guarantees. Major effort continued in support and follow-up of the Hiller and Hamilton Standard programs to resolve transmission system gearing, bearing, and lubricating problems. Necessary fixes were established in all cases in an expedited manner and released for fabrication and installation. At the close of the reporting period all fixes had been incorporated and acceptance testing of aircraft units was in process. Effort was also initiated during the month to incorporate control system changes necessary for first flight as determined during the flight control simulator tests. The changes were reviewed with ASD on 28 May and consist of the following:

a. Change from Ronson to Bendix solenoid valves in stab-governor system.

b. Changes to roll-yaw integrator "B" package to reduce yaw due to lateral control.

c. Addition of roll attitude control switch in cockpit.

d. Increase rudder feel forces and eliminate phasing.

e. Add relief valves and change plumbing to protect hydraulic pumps from gasket failure.

f. Add manual override in cockpit for collective throttle interconnect solenoid and for collective connected-up-range limit stops.

4.2 PROBLEM AREAS

4.2.1 Tri-Directional Gearcase

The redesigned 210-75997 and 998 gears, the 210-35362 gear assemblies, and the 210-75914 aluminum bronze scavenge pump gear were installed for acceptance test of the #1 unit. (See paragraph 3.1.7.2.2)

4.2.2 Pivot Gearcase

Reworked gears were installed in the gearcase during the month and acceptance testing initiated. However, during the test, the tilting mechanism was inadvertently operated with the clutch engaged causing damage to the shaft. Acceptance testing of the #1 aircraft unit will begin in early June. (See paragraph 3.1.7.2.1)

4.2.3 Main Gearcase Heat Rejection

All heat rejection fixes were incorporated and tests successfully completed. Acceptance tests of #1 aircraft units were initiated. The first unit for #2 nacelle was delivered to LTV on 26 May.

4.2.4 Ejection Seat

The second static firing of the ejection seat was delayed pending review of a report on man c.g. data received from ASD on 27 May. The report is being analyzed to determine whether or not the Douglas Escapac 1-C seat will perform satisfactorily under the full range of c.g.'s defined in the report. A discussion of the subject is planned at ASD on 8 and 9 June. The second firing is anticipated to be conducted by 15 June.

ITEM 5 DESIGN DATA

5.1 Status of Design Data

Preparation of design data reports as authorized by the Contract

Data Requirements Document continued during the reporting period with emphasis devoted to those reports required for first flight clearance. Test reports covering the starter pump, transmission system couplings, APU turbine, wind tunnel tests, and power control impedance tests were submitted during the reporting period. The fuel system test plan was submitted. Other submissions included the basic data report, wing fatigue inspection criteria, weight and balance status report, dynamic analysis of the transmission system report, aircraft dynamically similar model test report and a total of 11 structural and aerodynamic load reports.

5.2 Status of Technical Data

Overall status of design data and surveillance data as of 31 May was as follows:

	Design Data	Surveillance	Total
Total Submissions to date	145	178	323
Total Submissions to go	74	48	122
Grand Total	219	226	445
Percent Complete	66%	79%	72%

A total of 93 reports are required for first flight clearance. At the close of the reporting period 50 had been submitted. A total of 11 reports are currently considered behind schedule; however, submission of these is anticipated in June. By the end of June, the Contractor anticipates that 82 of the total reports required will have been submitted and the balance of 11 by 10 July.

5.3 SCN Status

As of the end of May, a total of 96 Specification Change Notices against contract reports had been submitted to ASD. Of these, 78 had been approved; 16 were disapproved; and 2 were pending.

ITEM 6 FLIGHT TEST AND INSTRUMENTATION

6.1 ACCOMPLISHMENTS

6.1.1 Instrumentation

The instrumentation effort during May continued to be devoted to calibration, installation and check-out of equipment. Check-out and calibration for aircraft #1 and #2 was 85% and 83% complete, respectively. Strain gage installation and calibration for ECP-10 was complete on the #2 aircraft. Strain gage installation and calibration for ECP-20 was complete on #1 main gear and installation was complete on the #2 main gear. Wiring information for ECP-20 was released on schedule.

6.1.2 Flight Test

General planning and coordination of the flight test program continued. Preparation of the Electronic Test Plan continued.

ITEM 7 REPORTS

The Technical Progress Report for the month of April was submitted to ASD on 18 May and the PERT report for April was submitted on 7 May. At the end of May, four critical paths in the same areas as had been reported last month appeared to be potential problem areas all with between one and two weeks of negative slack: main propeller integral gearcases for #1 and 2 aircraft; availability of shafting for #1 and 2 aircraft; availability of the tri-directional gearcase for #1 and 2 aircraft and availability of the pivot gearcase for #1 and 2 aircraft. The Financial Report for the month of April was submitted on 25 May.

ITEM 8 SPARE PARTS FOR FIVE PROTOTYPE AIRPLANES

Updating of the CFE section of the Test Support Table was completed during the reporting period with submittal to ASD anticipated in June.

ITEM 9 DEVELOPMENT AND FABRICATION OF AGE

The status of AGE development and fabrication at the end of May was as follows:

Through May	Anticipated	Submitted	Approved	Demonstrated
CFE AGERD	161	155	66	3
GFE AGERD	42	42	38	3

ITEM 10 SPARE PARTS FOR AGE - No activity during May.

ITEM 11 TRAINING AND TRAINING EQUIPMENT

The proposal for organizational maintenance pilot ground school and flight transition training was submitted to ATC on 13 May. The fourth series of training classes for Contractor personnel was completed on 21 May.

ITEM 12 CONTRACTOR SUPPORT OF FLIGHT TEST PROGRAM

A letter was received from WRAMA in early May indicating proposed Materiel Support Procedures for support of the XC-142A aircraft during Category I and II testing. Comments concerning the suggested procedures were submitted to WRAMA by the Contractor at the end of May. A letter from WRAMA was also received during the reporting period, forwarding information concerning Conex shipping containers to ship spares, AGE and tools to EAFB for support during the Category II flight test program. The feasibility of using these containers was determined to be satisfactory and a quantity was requested by the Contractor at the end of the month.

TRIPS DURING MAY, 1964

DATE	PLACE	PURPOSE
1-31	Hiller	Monitor program progress and provide technical assistance.
12-13	Hiller	Program cost review
12-13	AFFTC, EAFB	Materiel Support Procedures Conference
17-20	Western Gear	Evaluate proposal on flap brake
21	American Brake Shoe	Discussion of starter pump performance
22	Sargent-Fletcher	Review testing of wing motor gearcase
23	Western Gear	Witness tests of wing brake
28	ASD - SPO	Report of Simulator progress and clearance of Flight Control System for first flight.

VISITS TO LTV DURING MAY

DATE	FROM	PURPOSE
13-17	ASD - SPO	General Technical Review
15	WRAMA	Coordinate Materiel Support Procedures requirements with Contractor and local BuWeps Rep.

FUTURE SIGNIFICANT EVENTS

It is anticipated that the following significant items will be accomplished during the next three months:

June

- Completion of Aircraft Drop Tests
- Start of 150-Hour Functional Testing on PITS
- Start of 50-Hour Aircraft Tie-down Test
- Completion of 50-Hour Qualification Test on Pivot and Tri-Directional Gearcase
- Completion of 50-Hour Qualification Penalty Test of Main IGC
- Start of UHT Static Tests
- Start of Symmetrical Condition Static Tests
- Delivery of Main IGC's, Shafting, Pivot and Tri-Directional Gearcases for #1 Aircraft
- Accomplishment of Formal Aircraft Rollout Ceremony
- Firing of second Ejection Seat Test
- Completion of Wing Shaft Fatigue Test
- Completion of Main Prop IGC Barrel Fatigue Test
- Completion of Pivot and Tri-Directional Gearcase Static Tests
- Completion of Final Set of Flaps and Ailerons

July

- Completion of 50-Hour Aircraft Tie-down Test
- Start of Category I Flight Test Program

August

- Start of Pilot's Ground School Course
- Category I Shakedown Flight on #1 Aircraft

In addition, it is anticipated that the following budgetary proposal will be submitted to ASD in June:

ECP 24 Retrofit of Power Takeoff Engine Units

ECP INDEX

ECP No.	Title	Status
1	Fuselage, Installation of Aft Fuselage Escape Doors	Disapproved
2	Electrical, Installation of 35 KVA Generators	Disapproved
3	Electronics, Additional AT-256A/ARC UHF Communications Antenna; Installation of	Disapproved
4	Flight Tests, Category I Inflight Load Survey; Elimination of	Authorized
5	Ground Tests, Escape System Sled Tests; Elimination of	Authorized
6	Fuel System, Ferry Fuel Tank; Elimination of	Authorized
7	Escape System, Douglas Escapac 1-C Ejection Seat in Lieu of LW-1 (Modified) Seat; Installation of	Cancelled
8	Furnishings; Cargo, Troop Accessories for Four Airplanes, Elimination of	Authorized
9	Ground Test, Wing Fatigue Test; Elimination of	Authorized
10	Structural Demonstrator Instrumentation, Addition of	Authorized
11	Ground Test, Structural Failing Load Test, Elimination of	Authorized
12	Navigation Equipment, AN/ARC-21C in Lieu of AN/ARN-52 (V); Provisions for	Disapproved
13	Propulsion System, Integral Gearbox Propeller System Test; Reduction of	*
14	Drawing Quality Requirements; Reduction of	*
15	Weight Control Policy; Revision of	Disapproved
16	Main Propeller IGC Bearing Change	Authorized

ECP No.	Title	Status
17	Aluminum Forging Treatment to Improve Corrosion Resistance	Cancelled
18	Redesign Main Propeller Blade; Full Scale Test at NASA-Ames	Authorized
18-1	Redesign Main Propeller Blade; 0.60 Scale Test at NASA-Ames	Authorized
19	Elimination of Engine Nacelle Anti-Icing	Cancelled
20	Deletion of Category I Flight Tests on No. 4 Aircraft	Authorized
21	Cargo Compartment Trim; Elimination of	Disapproved
22	Revision to Engine Throttle Control Mechanism	Authorized
23	Extension of Category I Flight Test Program	Disapproved
24	Retrofit of Power Takeoff Engine Units	Pending

CCN INDEX

CCN No.	Title	Date
1	Substitute 35 KVA Generator for 25 KVA Generator	12-19-62
2	Reduction in Data Requirements and Engine Designation Change	4-26-63
3	Substitute 25 KVA Generator for 35 KVA Generator	2-04-63
4	Reduction in IGB Propeller Testing	5-03-63
5	Approval of ECPs 4-9	6-05-63
6	Elimination of Structural Failing Load Tests	7-23-63
7	Approval of ECPs 5, 6, 8, 9, 16	7-23-63
8	Additional Electronic Support Equipment	7-19-63
9	Cancellation of CCNs 5 and 7 and Approval of ECPs 5, 6, 8, 9, 16	8-02-63
10	Partial Cancellation of CCN No. 2 and Reinstatement of Reduction in Data Requirements	8-22-63
11	Partial Cancellation of CCN No. 2 and Reinstatement of Engine Designation Change	8-22-63
12	Approval of ECP 18-1	9-30-63
13	Approval of ECPs 4 and 10	11-13-63
14	Approval of ECP 18	11-19-63
15	Approval of Revision to Contract Data Requirements Document	12-05-63
16	Approval of ECP 20	2-19-64
17	Approval of Inspection of Damaged Engine	3-16-64

LIST OF ABBREVIATIONS

A/C	Aircraft
AGE	Aerospace Ground Equipment
AMC	Army Materiel Command
APU	Auxiliary Power Unit
ASD	Aeronautical Systems Division
ATC	Air Training Command
CCN	Contract Change Notice
CFE	Contractor Furnished Equipment
DIET	Design Information Element Test
EAFB	Edwards Air Force Base
ECP	Engineering Change Proposal
GFE	Government Furnished Equipment
IGC	Integral Gear Case
PERT	Program Evaluation and Review Technique
PITS	Propulsion Integrated Test Stand
QEC	Quick Engine Change
SPO	Systems Program Office
UHT	Unit Horizontal Tail
CSD	Constant Speed Drive
WRAMA	Warner Robbins Air Materiel Area